CLAIMS

What is claimed is:

1. An image data compression apparatus, comprising:

an image size conversion means for performing predetermined processing on input image data inputted in an image block of m pixels × n pixels (where m and n are natural numbers) to change a size of the image block;

a compression means for compressing image data in the image block changed in size by said image size conversion means;

an expansion means for expanding compressed image data compressed by said compression means to generate restored image data in the m-pixel × n-pixel image block;

a first correlation calculation means for obtaining a strength of a correlation between the restored image data generated by said expansion means and the input image data; and

a judgment means for judging whether or not the size of the image block is further changed by said image size conversion means based on the strength of a first correlation outputted from said correlation calculation means.

2. An image data compression apparatus, comprising:

an image size conversion means for performing

predetermined processing on input image data inputted in an image block of m pixels × n pixels (where m and n are natural numbers) to change a size of the image block;

a compression means for compressing image data in the image block changed in size by said image size conversion means;

an expansion means for expanding compressed image data compressed by said compression means to generate restored image data in the m-pixel × n-pixel image block;

a first correlation calculation means for obtaining a strength of a correlation between the restored image data generated by said expansion means and the input image data;

a second correlation calculation means for generating image data in a divided image block of a predetermined size based on the restored image data generated by said expansion means and obtaining a strength of a correlation between the generated image data in the divided image block and a part of the input image data corresponding to the divided image block; and

a judgment means for judging whether or not the size of the image block is further changed by said image size conversion means based on the strength of a first correlation outputted from said first correlation calculation means and the strength of a second correlation outputted from said second

correlation calculation means.

3. The image data compression apparatus according to claim 2, wherein said second correlation calculation means cuts out image data in a divided image block of m' pixels × n' pixels (where m' and n' are natural numbers and m' ≦ m, n' ≦ n) from the restored image data generated by said expansion means and obtains a strength of a correlation between the cutout image data in the divided image block and a part of the input image data corresponding to the divided image block.

4. The image data compression apparatus according to claim 2, wherein said second correlation calculation means combines the restored image data generated by said expansion means to generate image data in a divided image block of m' pixels × n' pixels (where m' and n' are natural numbers and m' > m, n' > n) and obtains a strength of a correlation between the generated image data in the divided image block and the input image data combined to correspond to the divided image block.

5. The image data compression apparatus according to claim 1, further comprising an image block extraction means for extracting image data to be compressed being a compression object in a unit of the m-pixel × n-pixel image block and inputting the extracted image data to be compressed as the input image data.

6. The image data compression apparatus

according to claim 5, further comprising a completely reversible coding means for performing completely reversible coding processing on compressed image data respectively corresponding to all the input image data compressed by said compression means when said judgment means judges that further change in size of the image block by said image size conversion means is not performed on all the input image data inputted from said image block extraction means.

7. The image data compression apparatus according to claim 6, wherein said completely reversible coding means performs completely reversible coding processing, by a plurality of completely reversible coding methods, on the compressed image data respectively corresponding to all the input image data compressed by said compression means,

said apparatus further comprising a completely reversible coding method selection means for comparing the compressed image data which have been subjected to the completely reversible coding processing by the plurality of completely reversible coding methods by said completely reversible coding means, and selecting a completely reversible coding method having a smallest data amount of the compressed image data which has been subjected to the completely reversible coding processing.

8. The image data compression apparatus according to claim 5, further comprising a resolution

conversion means for converting a resolution of the image data to be compressed at a predetermined resolution change rate and supplying the resolution to said image block extraction means.

9. The image data compression apparatus according to claim 1, wherein the strength of the correlation is a correlation value between each pixel value of image data relating to a restored image based on the restored image data generated by said expansion means and each pixel value of the input image data corresponding to the image data.

10. The image data compression apparatus according to claim 9, wherein the correlation value is an S/N ratio between each pixel value of the image data relating to the restored image and each pixel value of the input image data corresponding to the image data.

11. The image data compression apparatus according to claim 9, wherein the correlation value is a mean square error between each pixel value of the image data relating to the restored image and each pixel value of the input image data corresponding to the image data.

12. The image data compression apparatus according to claim 9, wherein the correlation value is a differential absolute distance between each pixel value of the image data relating to the restored image and each pixel value of the input image data corresponding to the image data.

13. The image data compression apparatus according to claim 10, wherein said judgment means judges that the size of the image block is further changed by said image size conversion means when the correlation value is smaller than a predetermined threshold value.

14. The image data compression apparatus according to claim 11, wherein said judgment means judges that the size of the image block is further changed by said image size conversion means when the correlation value is larger than a predetermined threshold value.

15. The image data compression apparatus according to claim 12, wherein said judgment means judges that the size of the image block is further changed by said image size conversion means when the correlation value is larger than a predetermined threshold value.

16. The image data compression apparatus according to claim 1, wherein said compression means and said expansion means perform compression and expansion by vector quantization using a code book method respectively.

17. The image data compression apparatus according to claim 16, wherein patterns of an image block of a pixels × b pixels (where a and b are natural numbers) in the code book are arranged such that patterns with a smallest mean square error have adjacent addresses.

18. The image data compression apparatus according to claim 16, wherein patterns of an image block of a pixels × b pixels (where a and b are natural numbers) in the code book are arranged such that patterns with a smallest differential absolute distance have adjacent addresses.

19. The image data compression apparatus according to claim 16, wherein patterns of an image block of a pixels × b pixels (where a and b are natural numbers) in the code book are arranged adjacent under a predetermined rule, and a predetermined number of patterns having element values in the a-pixel × b-pixel image block which are all same are further arranged at adjacent addresses prior or subsequent to addresses at which the patterns of the image pattern are arranged under the predetermined rule.

20. An image data compression apparatus, comprising:

a compression means for compressing input image data inputted by a predetermined compression method;

a completely reversible coding means for performing completely reversible coding processing, by a plurality of completely reversible coding methods, on compressed image data obtained by compressing the input image data by said compression means; and

a completely reversible coding method selection means for comparing the compressed image data which

have been subjected to the completely reversible coding processing by said completely reversible coding means, and selecting a completely reversible coding method having a smallest data amount of the compressed image data which has been subjected to the completely reversible coding processing.

21. The image data compression apparatus according to claim 20, wherein said compression means compresses the input image data by vector quantization using a code book method.

22. The image data compression apparatus according to claim 21, wherein patterns of an image block of a pixels × b pixels (where a and b are natural numbers) in the code book are arranged such that patterns with a smallest mean square error have adjacent addresses.

23. The image data compression apparatus according to claim 21, wherein patterns of an image block of a pixels × b pixels (where a and b are natural numbers) in the code book are arranged such that patterns with a smallest differential absolute distance have adjacent addresses.

24. The image data compression apparatus according to claim 21, wherein patterns of an image block of a pixels × b pixels (where a and b are natural numbers) in the code book are arranged adjacent under a predetermined rule, and a predetermined number of patterns having element values in the a-pixel × b-pixel image block which are

all same are further arranged at adjacent addresses prior or subsequent to addresses at which the patterns of the image pattern are arranged under the predetermined rule.

25. An image data compression method, comprising: performing predetermined processing on input image data inputted in an image block of m pixels × n pixels (where m and n are natural numbers) to change a size of the image block; compression-processing image data in the image block changed in size; expansion-processing compressed image data obtained by the compression processing to generate restored image data in the m-pixel × n-pixel image block; obtaining a first correlation strength indicating a strength of a correlation between the generated restored image data and the input image data; and judging whether or not the size of the image block is further changed based on the first correlation strength.

26. An image data compression method, comprising: performing predetermined processing on input image data inputted in an image block of m pixels × n pixels (where m and n are natural numbers) to change a size of the image block; compression-processing image data in the image block changed in size; expansion-processing compressed image data obtained by the compression processing to generate restored image data in the m-pixel × n-pixel image block; obtaining a first correlation strength

indicating a strength of a correlation between the generated restored image data and the input image data; generating image data in a divided image block of a predetermined size based on the generated restored image data; obtaining a second correlation strength indicating a strength of a correlation between the generated image data in the divided image block and a part of the input image data corresponding to the divided image block; and judging whether or not the size of the image block is further changed based on the first correlation strength and the second correlation strength.

27. The image data compression method according to claim 26, wherein image data in a divided image block of m' pixels × n' pixels (where m' and n' are natural numbers and $m' \leqq m$, $n' \leqq n$) is cut out from the generated restored image data, and a strength of a correlation between the cutout image data in the divided image block and a part of the input image data corresponding to the divided image block is obtained as the second correlation strength.

28. The image data compression method according to claim 26, wherein the generated restored image data are combined to generate image data in a divided image block of m' pixels × n' pixels (where m' and n' are natural numbers and $m' > m$, $n' > n$), and a strength of a correlation between the generated image data in the divided image block and the input image data combined to correspond to the divided image

block is obtained as the second correlation strength.

29. The image data compression method according to claim 25, further comprising: extracting image data to be compressed being a compression object in a unit of the m-pixel × n-pixel image block and inputting the extracted image data to be compressed as the input image data; and performing completely reversible coding processing on compressed image data respectively corresponding to all the input image data obtained by the compression processing when it is judged that further change in size of the image block is not performed on all the input image data inputted.

30. The image data compression method according to claim 29, further comprising: performing completely reversible coding processing, by a plurality of completely reversible coding methods, on the compressed image data respectively corresponding to all the input image data obtained by the compression processing; and selecting a completely reversible coding method having a smallest data amount of the compressed image data which have been subjected to the completely reversible coding processing by the plurality of completely reversible coding methods.

31. The image data compression method according to claim 25, further comprising converting a resolution of image data to be compressed being a compression object at a predetermined resolution

change rate, extracting image data to be compressed converted in resolution in a unit of the m-pixel × n-pixel image block, and inputting the extracted image data to be compressed as the input image data.

32. The image data compression method according to claim 25, wherein the strength of the correlation is a correlation value between each pixel value of image data relating to a restored image based on the generated restored image data and each pixel value of the input image data corresponding to the image data.

33. The image data compression method according to claim 32, wherein the correlation value is any of an S/N ratio, a mean square error, and a differential absolute distance between each pixel value of the image data relating to the restored image and each pixel value of the input image data corresponding to the image data.

34. The image data compression method according to claim 25, wherein the compression processing and the expansion processing perform compression and expansion by vector quantization using a code book method respectively.

35. An image data compression method, comprising: compression-processing input image data inputted by a predetermined compression method; performing completely reversible coding processing, by a plurality of completely reversible coding methods, on compressed image data obtained by the compression processing; and selecting a completely

reversible coding method having a smallest data amount of the compressed image data which has been subjected to the completely reversible coding processing.

36. The image data compression method according to claim 35, wherein the compression processing compresses the input image data by vector quantization using a code book method.

37. A computer readable recording medium on which a program product is recorded, said program product comprising:

a computer readable program code means for functioning as:

an image size conversion means for performing predetermined processing on input image data inputted in an image block of m pixels × n pixels (where m and n are natural numbers) to change a size of the image block;

a compression means for compressing image data in the image block changed in size by the image size conversion means;

an expansion means for expanding compressed image data compressed by the compression means to generate restored image data in the m-pixel × n-pixel image block;

a first correlation calculation means for obtaining a strength of a correlation between the restored image data generated by the expansion means and the input image data; and

a judgment means for judging whether or not the size of the image block is further changed by the image size conversion means based on the strength of a first correlation outputted from the correlation calculation means.

38. A computer readable recording medium on which a program is recorded, said program product comprising:

a computer readable program code means for performing predetermined processing on input image data inputted in an image block of m pixels × n pixels (where m and n are natural numbers) to change a size of the image block;

a computer readable program code means for compression-processing image data in the image block changed in size;

a computer readable program code means for expansion-processing compressed image data obtained by the compression processing to generate restored image data in the m-pixel × n-pixel image block;

a computer readable program code means for obtaining a first correlation strength indicating a strength of a correlation between the generated restored image data and the input image data; and

a computer readable program code means for judging whether or not the size of the image block is further changed based on the first correlation strength.

39. A computer program product comprising:

a computer readable program code means for functioning as:

an image size conversion means for performing predetermined processing on input image data inputted in an image block of m pixels × n pixels (where m and n are natural numbers) to change a size of the image block;

a compression means for compressing image data of the image block changed in size by the image size conversion means;

an expansion means for expanding compressed image data compressed by the compression means to generate restored image data in the m-pixel × n-pixel image block;

a first correlation calculation means for obtaining a strength of a correlation between the restored image data generated by the expansion means and the input image data; and

a judgment means for judging whether or not the size of the image block is further changed by the image size conversion means based on the strength of a first correlation outputted from the correlation calculation means.

40. A computer program product comprising:

a computer readable program code means for performing predetermined processing on input image data inputted in an image block of m pixels × n pixels (where m and n are natural numbers) to change a size of the image block;

a computer readable program code means for compression-processing image data in the image block changed in size;

a computer readable program code means for expansion-processing compressed image data obtained by the compression processing to generate restored image data in the m-pixel × n-pixel image block;

a computer readable program code means for obtaining a first correlation strength indicating a strength of a correlation between the generated restored image data and the input image data; and

a computer readable program code means for judging whether or not the size of the image block is further changed based on the first correlation strength.